



Advancing the Future of the Mountain State

Secure Software Development

Dual Model Apprenticeships

Apprenticeships in Motion Summits

Girish Seshagiri

















Why We Are Here

- Discuss "How to"
 - Promote, expand, and increase the number of registered apprenticeships
 - Improve the capacity of traditional providers to serve the apprenticeship model
 - Integrate apprenticeships into your current skill building and HR strategies for talent pipeline
 - Access information/resources to help you get started
- Discuss "What"
 - Are the challenges and opportunities for workforce development
 - Are the key requirements of DoL Registered Apprenticeships
- Consensus view
 - Apprenticeships because "nothing else works"















Why We Are Here

- Increasing number of cyber attacks against critical infrastructure
- 90% of attacks are successful by exploiting defects in software
- Software developers not trained to deliver software with fewer vulnerabilities
- 1.8 million cybersecurity jobs currently unfilled
- High youth unemployment and large number of under-employed people
- Under-representation of women and minorities in technology professions
- Student debt > 1.0 trillion
- Cost of status quo





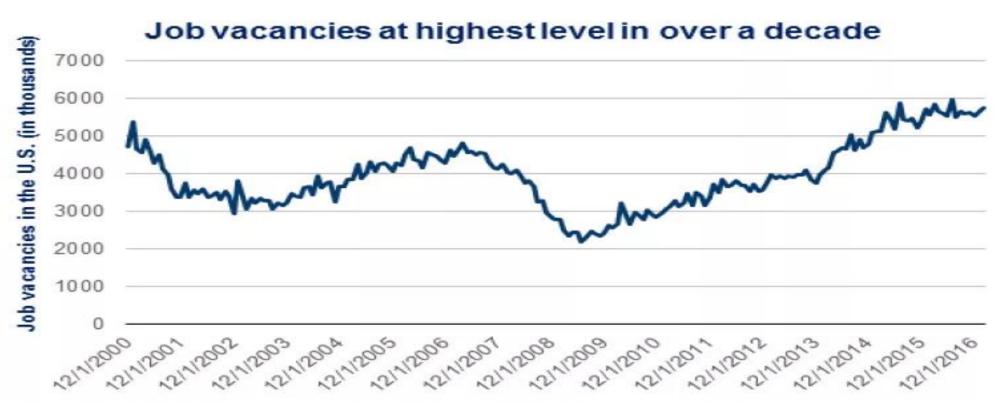








Total Number of Unfilled Jobs



Source: Organization for Economic Co-operation and Development, Total Unfilled Job Vacancies for the United States® [LMJVTTUVUSM647S], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/LMJVTTUVUSM847S, June 28, 2017.





















Disruptive Technologies

Top Perceived Technological Drivers of Change

Driver of Change	% Rating This as a Top D	Driver Time Frame
Mobile Internet and cloud technolo	gy 34	2016-2017
Advances in computing power and	big data 26	2015-2017
New energy supplies and technolog	gies 22	2015-2017
The Internet of things	14	2015-2017
Crowdsourcing, the sharing econon and peer-to-peer platforms	ny, 12	Felt already
Advanced robotics and autonomous	s transport 9	2018-2020
Artificial intelligence and machine	learning 7	2018-2020
Advanced manufacturing and 3D p	rinting 6	2015-2017
Advanced materials, biotechnology, and genomics	6	2018-2020

SOURCE World Economic Forum, 2016, *The Future of Jobs: Employment Skills and Workforce Strategy for the Fourth Industrial Revolution*, http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf.











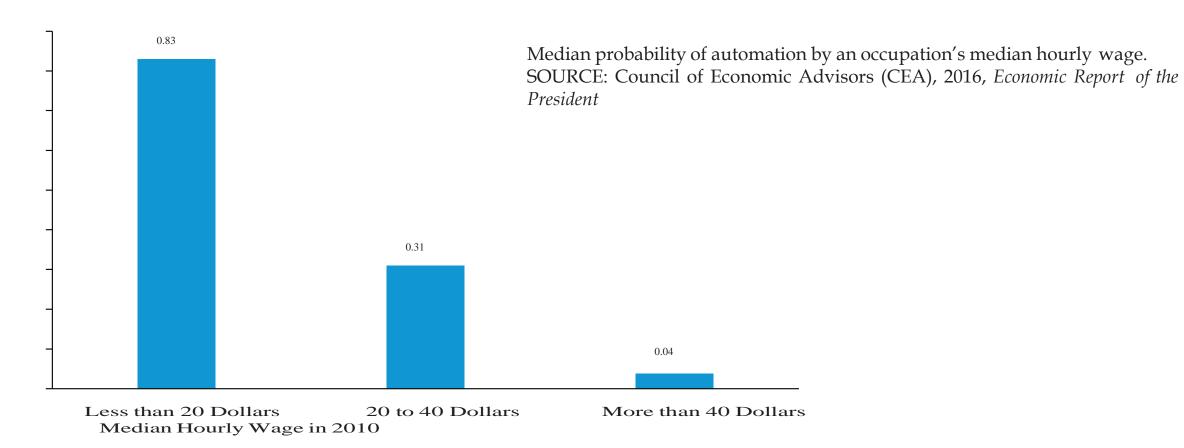








Jobs for the Future













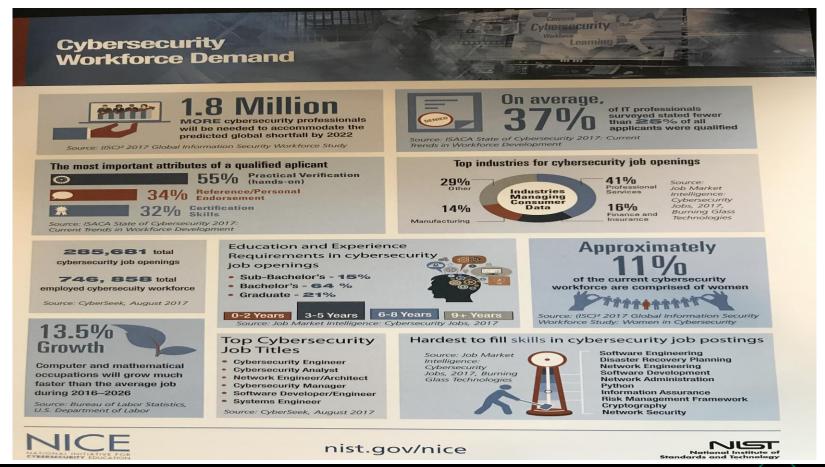








Cybersecurity Skills Shortage













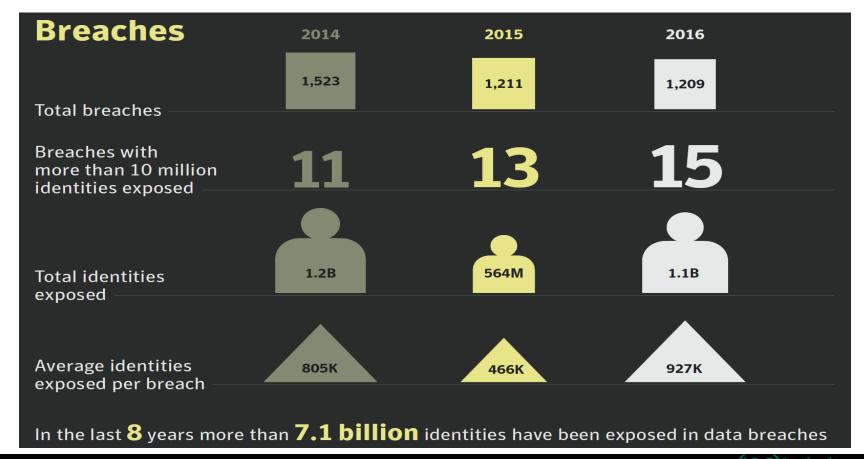








Personal Identity Breaches













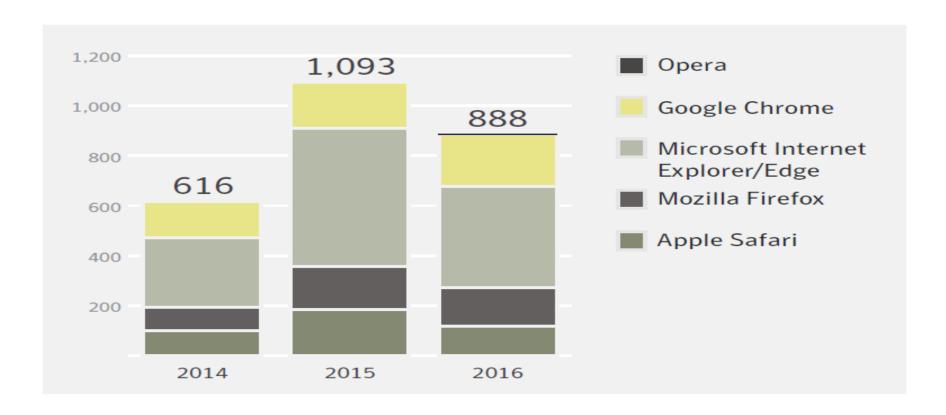


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Browser Vulnerabilities











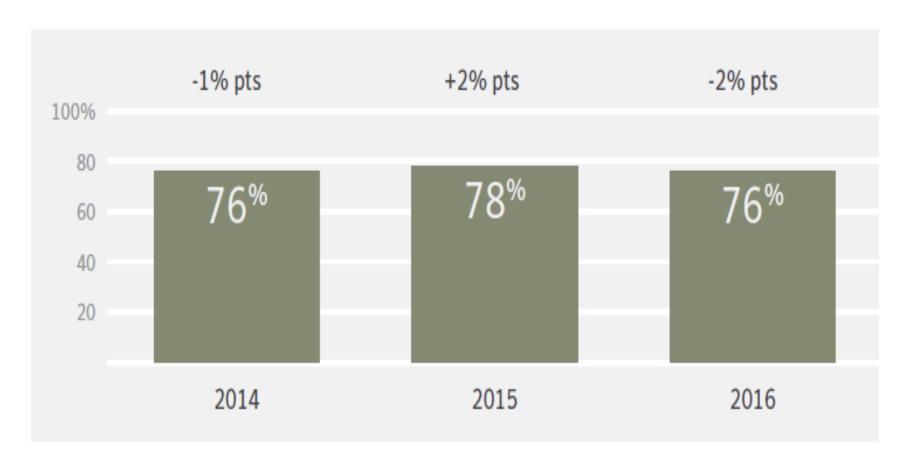








Websites with Vulnerabilities















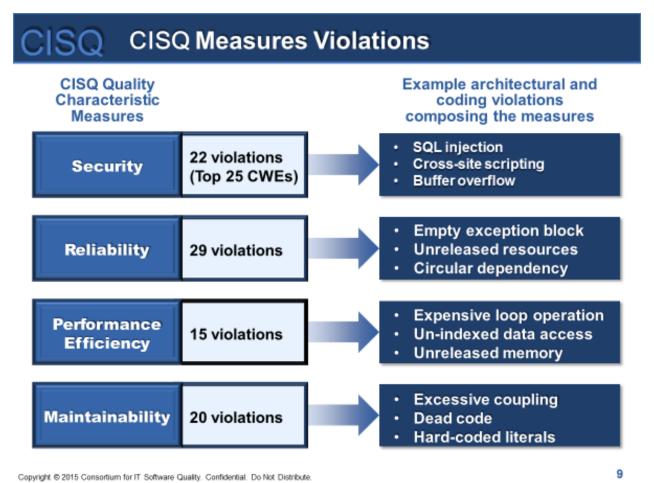








CISQ Quality Characteristic Violations





















Cybersecurity: the Hottest New Major In College

Large numbers of US colleges have added undergraduate cybersecurity majors, cybersecurity concentrations to other majors, and master's degree programs in cybersecurity. Most colleges, however, do not know what to teach, and many are teaching students only how to admire the cybersecurity problem, but not how to fix it. Further, computer science graduates don't learn secure coding or other technical cybersecurity topics. None of the top ten undergraduate computer science and engineering programs at American universities (as ranked by the U.S. News & World Report) required its students to take a cybersecurity course in order to graduate.

Read more in:

- www.villagevoice.com: How Cybersecurity Became 2017's Hot New Major

















Educational System's Challenge

100 9th graders begin high school students reach graduation 23 do not graduate System 33 do not enroll in college Works for only 18% - 23% Education 35 Students return 9 do not return for a second year of students 23 Students receive a post secondary degree within 150% of 12 do not allotted time (Certificate, associates or bachelors) immediately enter 18 employment in State

The challenge: How do we prepare the talent needed by business to be globally competitive

















Cost of Status Quo

ltem	Cost
Two-year and four-year college	\$400 billion per year
Post-secondary workforce education and training	\$600 billion per year
Skills gap	\$160 billion per year
Time for new employees to reach full productivity	> Five months on average
Replacing an employee	Ranges from 6 to 24 months of the position's salary

Source: Georgetown University Center on Education and the Workforce











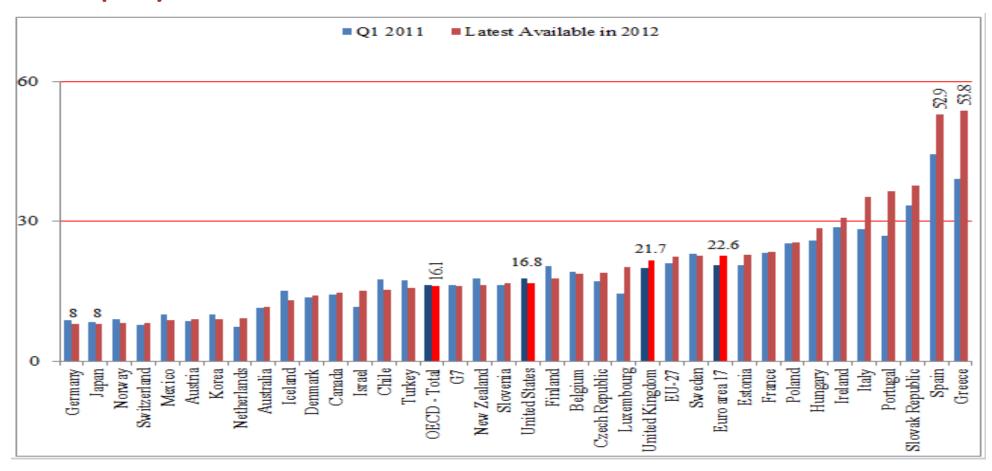


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Youth Unemployment













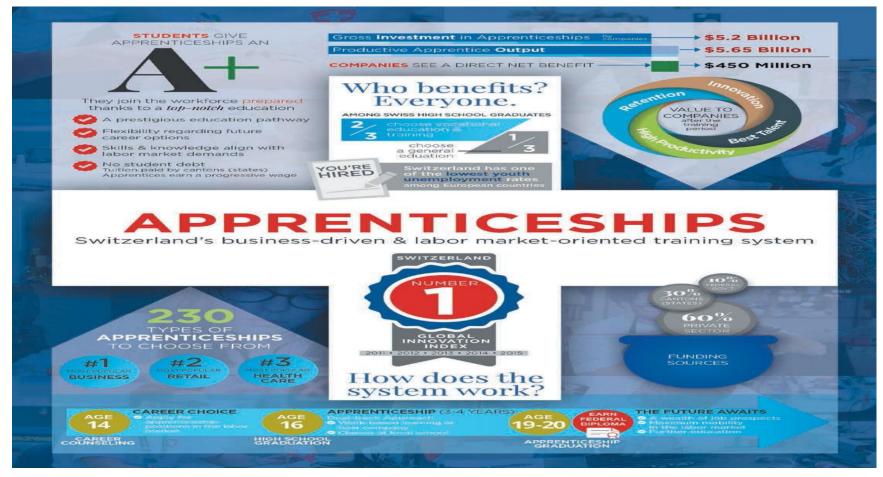








Swiss Dual Track Vocational Education and Training Model















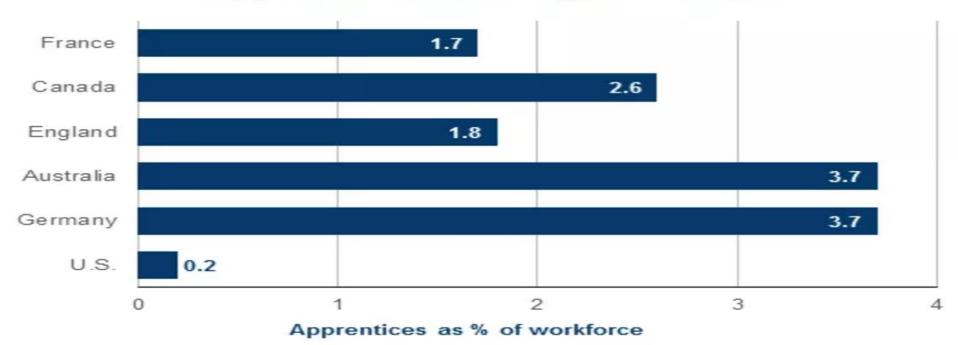






Apprenticeships in the U.S.

Apprentices: not big in the U.S.



Source: Robert Lerman, *Are Employers Providing Enough Training? Theory, Evidence and Policy Implications," prepared for National Academy of Sciences, 2015

















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US Department of Labor Initiative



- An exciting national renewal and reimagining of registered apprenticeship
- Learn, borrow and steal from Europe
- Expand in new, non-traditional industries and occupations
- \$165 million in new funding for Registered Apprenticeship



















DoL Registered Apprenticeship Requirement



Core Components of Registered Apprenticeship



Employer Involvement Is Integral

Employer is the foundation for the RA program and must be directly involved and provider of OJT



Structured On-the-Job Training with Mentoring

Minimum of 2,000 hours Structured and Supervised



Related Training and Instruction

144 hours recommended per year Parallel | Front-loaded | Segmented Options



Rewards for Skill Gains

Increases in skills brings about increases in earnings



National Occupational Credential

Nationally recognized credential showing job proficiency. Sponsor certifies individual is fully competent for career.

















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Employer-Led Collaborative Design





















How does Apprenticeship Benefit Employers?

- Helps business develop highly skilled employees
- Increases retention rates and productivity, and lowers the cost of recruitment
- Direct Cost Savings to Company hire apprentices at lower salaries - as skills increase, wages increase
- Diversify workforce attract veterans, women and minorities
- Gives companies an edge over their competition

















How Does Apprenticeship Help Job-Seekers?

Hands-on Career Training	Practical on-the-job training in a wide variety of occupations and industries	
An Education	Hands-on and technical training which has the potential to earn college credits	
Long-term Career and Greater Earning Potential	Following apprenticeship completion	
	and Asia Control of the Control of t	
Little/No Education Debt	Apprenticeship = College Without the Debt	
	TOTAL OF THE PARTY	
National Credential	Upon graduation, a certified portable credential nationally recognized by industries and employers	
	STORY OF THE STORY	



















CICESS

- Community Initiative Center of Excellence for Secure Software
- Solving Cybersecurity Skills Shortage With Apprenticeships and Certifications
- Launched successfully in Fall 2015, partnering with Illinois Central College and the Peoria Public Schools









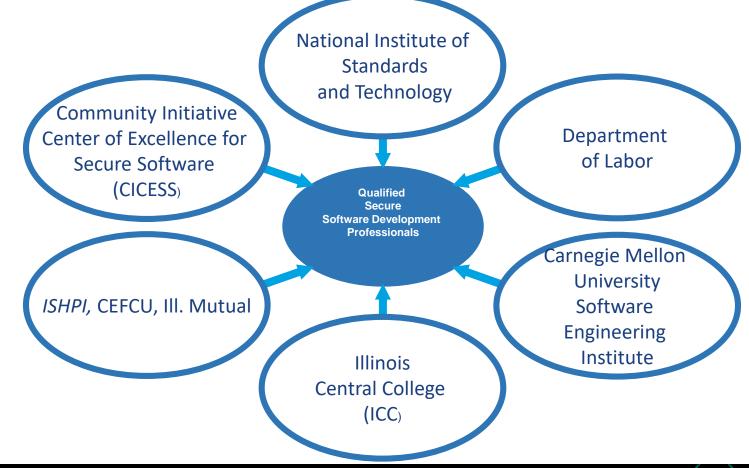








A Unique Collaboration – Industry, Government, Academe













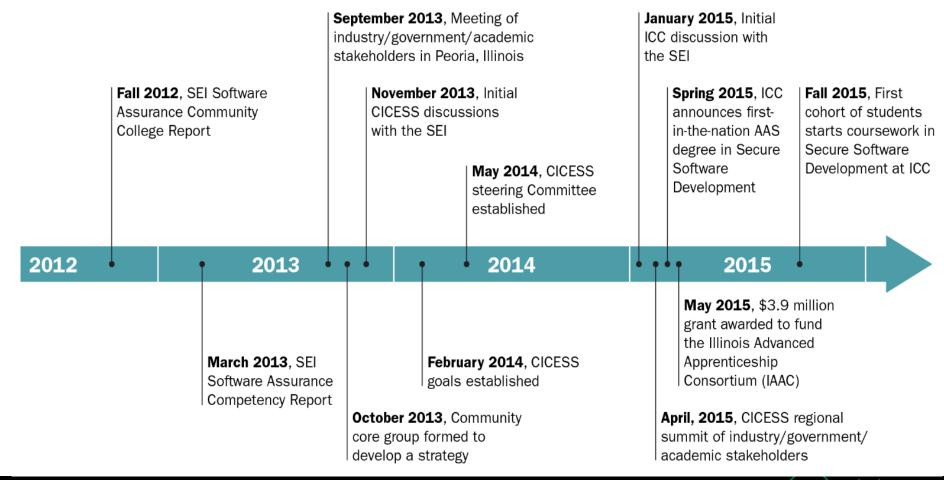








Timeline for the Community College and Industry Apprenticeship Program





















Apprenticeship Dual Model Computer Programing (Secure Software)

2-3-year dua	I model "learn a	and earn" program
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On the job training

Class room instruction

Employment contract executed between company and apprentice

Dual work study model with increasing hours under company supervision and mentorship as training progresses

Standard apprenticeship topics defined by industry and aligned with Carnegie Mellon **University / Software Engineering Institute** Full time student AAS degree in Secure **Software Development at local** community college

Dual work study model with more classroom hours at the beginning

Curriculum created by Carnegie Mellon University and adopted to meet industry requirements

Practicum examination and standard industry certifications to validate competency





















CICESS Value Proposition

- Augmentation of your current workforce development methods
- Ability to plan for and satisfy future needs for hard-to-fill secure software developers
- Ability to build a secure software talent pipeline that includes women and minorities who are trained, mentored, and certified
- A cost-effective solution to training and retaining new workers in secure software development
- High retention rates when apprentices become full-time employees









Why Apprenticeships?

Because Nothing Else Works



















Bias for Action

- 1. Form core group of stakeholders to develop pathways to middle class jobs in cybersecurity
- SW Developers jobs in-demand? Other cybersecurity skills in-demand?
- Review CMU/SEI curriculum and offer AAS Degree in Secure Software Development
- 4. Employers willing to partner with community colleges, and invest in 2,000 hours of paid apprenticeships to build pipeline and address skills shortage
- Design and implement dual model apprenticeships
- Launch cohort

















Takeaways/"ASKs"

- Act with a sense of urgency to address unsustainable trends and exploit rare economic development opportunity to create hundreds of thousands of middle class jobs
- Develop industry/government/academic coalition led by industry to address cybersecurity "skills gap" and talent pipeline
- Take immediate steps to connect education directly to a job through a dual "learn and earn" registered apprenticeship program
- In your community, develop skilled workforce based on validated competencies and industry standard certifications
- Stay on the message: Apprenticeships are good for business with positive return on investment

















Contact

Girish Seshagiri

girish.seshagiri@ishpi.net

703 426-2790











